Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

**Radioactive Decay of “Pennium”**

*This simulation provides examples of the rates at which radioactive isotopes decay.*

**Procedure 1: 40 ATOMS OF PENNIUM**

1. Place 40 atoms of PENNIUM (pennies) in the bag.
2. Seal the bag and gently shake for 10 seconds.
3. Gently pour out pennies onto the desk.
4. When you pour them out, count the atoms with “tails” showing – these atoms have “decayed.”
5. Return only the pennies with the “heads” up back to the bag. Reseal the bag.
6. Set the “tails” pennies aside.
7. Gently shake the sealed bag for 10 seconds and repeat the above procedure.
8. Continue shaking, counting, and setting aside pennies until all the atoms have decayed.

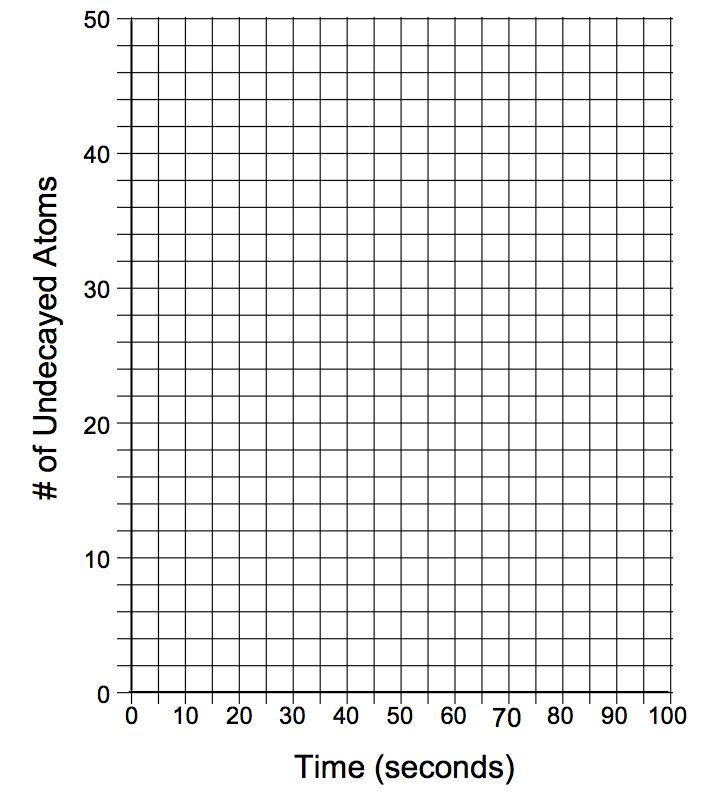
|  |  |  |  |
| --- | --- | --- | --- |
| **Half-life number** | **Total time (sec)** | **Total number of decayed atoms** | **Total number of undecayed atoms** |
| 0 | 0 | 0 | 40 |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |
| 7 |  |  |  |
| 8 |  |  |  |
| 9 |  |  |  |
| 10 |  |  |  |

**Procedure 2: 20 ATOMS OF PENNIUM**

1. Repeat Procedure 1 above, but this time use 20 atoms of PENNIUM (pennies) and shake the bag for 5 seconds between pouring instead of 10 seconds.
2. Graph the number of undecayed atoms vs. time.
3. Answer all of the questions on your lab sheet.

| **Half-life number** | **Total time (sec)** | **Total number of decayed atoms** | **Total number of undecayed atoms** |
| --- | --- | --- | --- |
| 0 | 0 | 0 | 20 |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |
| 7 |  |  |  |
| 8 |  |  |  |
| 9 |  |  |  |
| 10 |  |  |  |

**Graph BOTH procedures below. Connect your data points. Use a different color for each procedure, and make it clear which is which.**



**Post-Simulation Questions (answer below or on a separate sheet of paper and WRITE IN SENTENCES for questions 4-8!**

1. In the experiment, what was the half-life of the element pennium in Procedure 1?
2. In the experiment, what was the half-life of the element pennium in Procedure 2?
3. After two half-lives, what fraction of the atoms of pennium (Procedure 1) had not decayed?
4. Compare the shape of the two graphs you drew.
5. Does half-life depend on how much of an element you started with? Explain.
6. Does the decay curve depend on how much you started with or the half-life? Explain.
7. Does exactly the same fraction of pennium atoms decay during each half-life? What does this suggest about half-life?
8. What are such variations not likely to be obvious when actual atoms are involved?